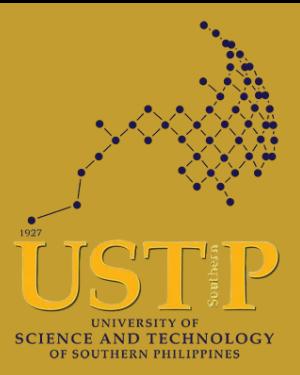




# Social and Economic Determinants of Birth Rates in 2023: A Cross-Country Analysis

Linear Regression Analysis of Social and Economic Determinants



DEPARTMENT OF DATA SCIENCE  
COLLEGE OF INFORMATION TECHNOLOGY AND COMPUTING  
UNIVERSITY OF SCIENCE AND TECHNOLOGY OF SOUTHERN PHILIPPINES  
CAGAYAN DE ORO CITY, 9000 PHILIPPINES

## Abstract

In 2023, cross-country differences in birth rates are mainly driven by demographic factors: maternal age, age dependency, child mortality, and crude death rates. Economic indicators like GDP per capita and government spending have no independent effect once social factors are considered. These results suggest that fertility policies should prioritise long-term demographic strategies.

## Research Problem

**"What drives the rise and fall of birth rates in 2023?"**

Despite global attention on fertility, birth rates vary widely due to social factors: maternal age, age dependency, child mortality; and economic factors: GDP growth, government revenue, and spending. Understanding their interaction is key to policies supporting population growth, maternal and child health (SDG 3), economic stability (SDG 8), and reduced inequalities (SDG 10).

## Dataset and Regression Approach

YEAR: 2023  
SAMPLE: 65 COUNTRIES  
SOURCE: OUR WORLD IN DATA (OWID)  
(AGGREGATES WORLD BANK, IMF, PENN WORLD TABLE)



### Dependent Variable

Crude Birth Rate (CBR) – births per 1,000 population

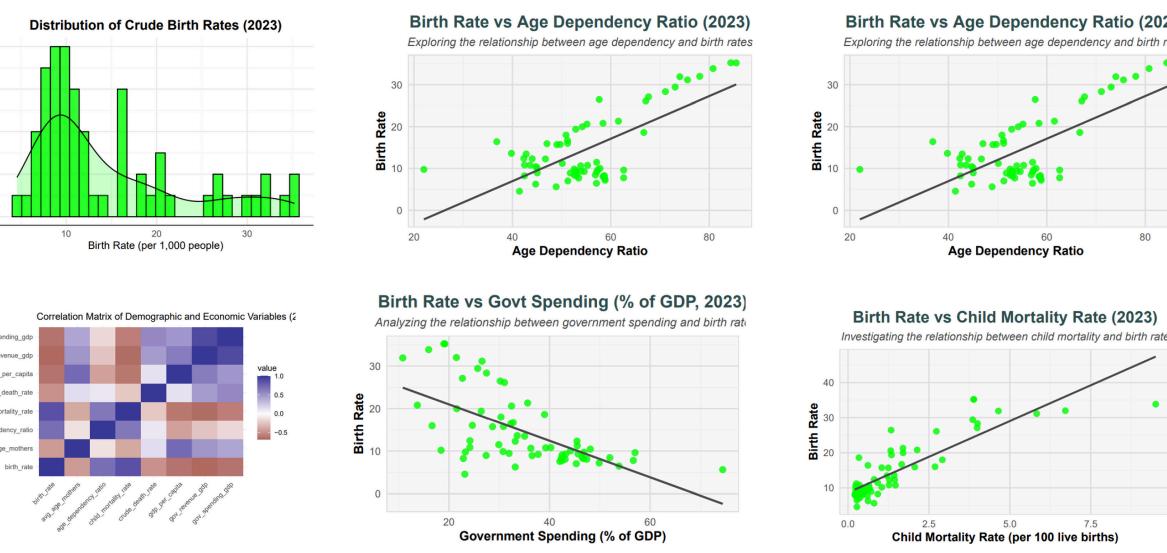
### Social / Demographic Factors

- Average age of mothers
- Age dependency ratio – dependents per working-age population
- Child mortality rate – deaths per 1,000 under-5 children
- Crude death rate – deaths per 1,000 population

### Economic / Fiscal Factors

- GDP per capita – current US\$ per person
- Government revenue (% of GDP)
- Government consumption spending (% of GDP)

### Linear Regression Models



### Robustness

- Scale-location plots → heteroskedasticity detected visually
- Low test power – Breusch-Pagan p = 0.170
- Heteroskedasticity-robust standard errors (HC1) applied
- Ensures valid statistical inference



### Econometric Model:

- Log-linear OLS regression
- $$\ln(\text{BirthRate}) = \beta_0 + \beta_1(\text{AvgAgeMothers}) + \beta_2(\text{AgeDependency}) + \beta_3 \ln(\text{ChildMortality}) + \beta_4(\text{CrudeDeathRate}) + \beta_5 \ln(\text{GDPpc}) + \beta_6(\text{FiscalVars}) + \varepsilon$$

## Conclusion

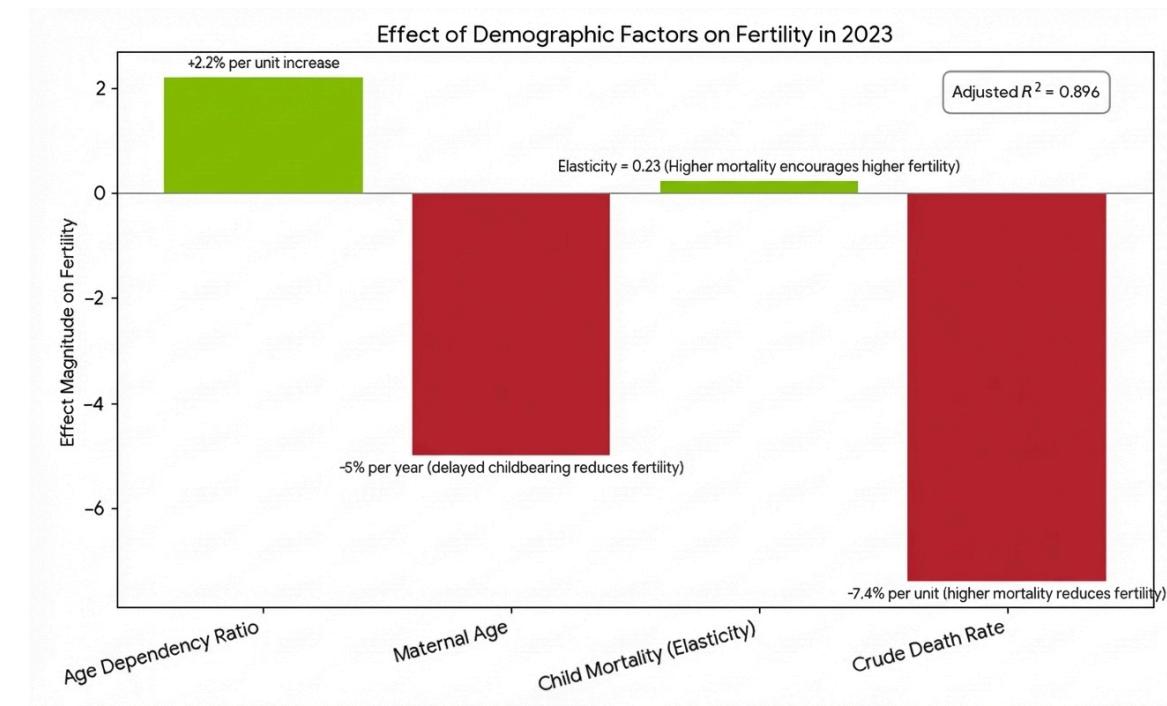
Fertility differences in 2023 were driven mainly by demographic structure and mortality rather than fiscal measures, highlighting the need for long-term policies that improve child survival, support work-life balance, and adapt to aging populations.



## Key Findings

Fertility differences in 2023 are driven mainly by demographic structure and mortality rather than economic conditions.

- Higher age dependency increases birth rates
- Delayed childbearing and higher death rates reduce fertility
- Child mortality is positively linked to fertility
- Economic and fiscal effects are insignificant
- Model explains ~90% of fertility variation (Adjusted R<sup>2</sup> = 0.896)



## Limitations and Future Directions



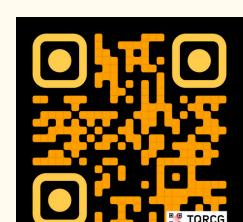
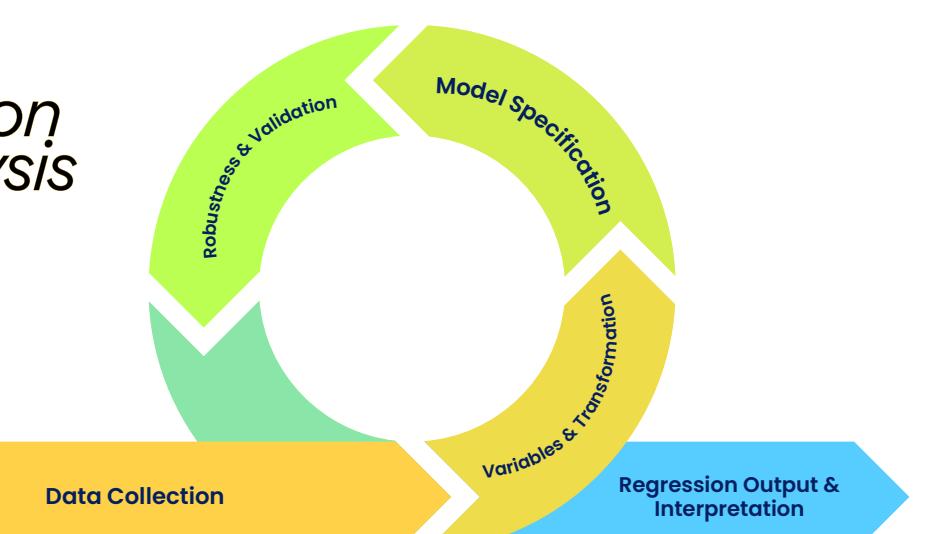
## Implications

Fertility policy should prioritise demographic and health structures over short-term fiscal measures.

- Focus on child survival, work-life balance, and ageing adaptation
- Fiscal expansion alone has limited short-term impact on fertility

## Project Development Cycle

From data collection to regression analysis

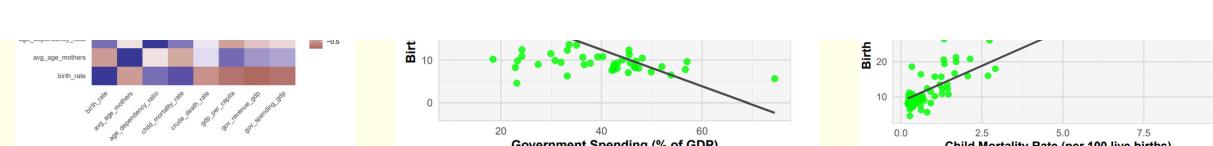


**"LifePulse: The Heartbeat of Global Fertility"**

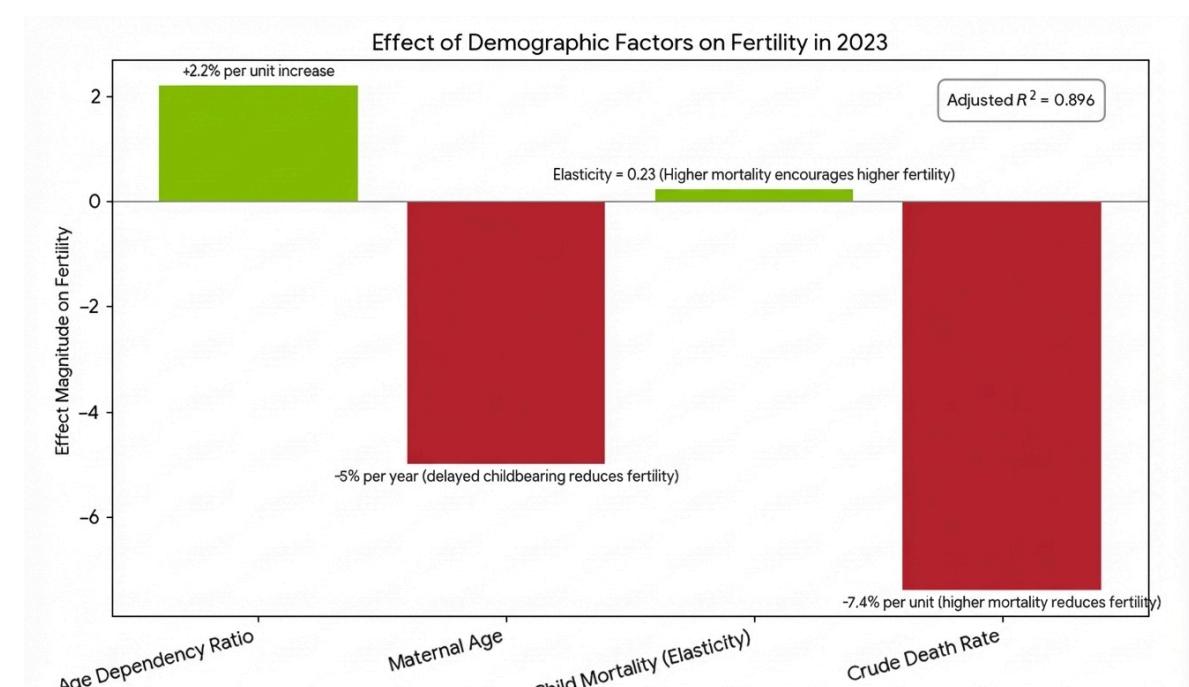
JOSH GANHINHIN | JOMAR LIGAS | LEX LEANDER LUMANTAS | MARK ORAÑO | PHILIP ANDREE TUPAS

## Key Findings

Fertility differences in 2023 are mainly driven by demographic structure and mortality, with economic factors showing little effect, and the model explaining about 90% of fertility variation.



DEPARTMENT OF DATA SCIENCE  
COLLEGE OF INFORMATION TECHNOLOGY AND COMPUTING  
UNIVERSITY OF SCIENCE AND TECHNOLOGY OF SOUTHERN PHILIPPINES  
CAGAYAN DE ORO CITY, 9000 PHILIPPINES



## Conclusion

Fertility differences in 2023 were mainly driven by demographic and mortality factors, underscoring the need for long-term, population-focused policies.

## DATASET AND REGRESSION APPROACH

**YEAR:** 2023  
**SAMPLE:** 65 COUNTRIES  
**SOURCE:** OUR WORLD IN DATA (OWID)  
(AGGREGATES WORLD BANK, IMF, PENN WORLD TABLE)

### Dependent Variable

Crude Birth Rate (CBR) –  
births per 1,000 population

### Economic / Fiscal Factors

- GDP per capita – current US\$ per person
- Government revenue (% of GDP)
- Government consumption spending (% of GDP)

### Robustness

- Scale-location plots show visual heteroskedasticity
- Breusch-Pagan test low power ( $p = 0.170$ )
- HC1 robust standard errors applied
- Ensures valid inference

### Social / Demographic Factors

- Average age of mothers
- Age dependency ratio: dependents per working-age population
- Child mortality rate: deaths per 1,000 under-5 children
- Crude death rate: deaths per 1,000 population

### Econometric Model

Model: Log-linear OLS regression

$$\ln(\text{BirthRate}) = \beta_0 + \beta_1(\text{AvgAgeMothers}) + \beta_2(\text{AgeDependency}) + \beta_3 \ln(\text{ChildMortality}) + \beta_4(\text{CrudeDeathRate}) + \beta_5 \ln(\text{GDPpc}) + \beta_6(\text{FiscalVars}) + \varepsilon$$

## Implications

Fertility policy should prioritise demographic and health structures, as short-term fiscal measures alone have limited impact on fertility.

## Project Development Cycle

*From data collection to regression analysis*

